APPARATUS FOR FEEDING PRINTING PAPER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 2003-53974 filed August 5, 2003, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a printer or a scanner. More particularly, the present invention relates to an apparatus for separately feeding printing papers sheet by sheet, which is capable of separating and delivering each sheet of paper individually from a paper stack in a paper tray of a printer or a scanner.

Description of the Related Art

[0003] For an image forming apparatus, there are printers for printing predetermined data on a sheet of paper, scanners for reading images and characters on a sheet of paper, and composite machines for selectively performing either a printer function or a scanner function through one apparatus. Generally, such image forming apparatus include an apparatus for separating sheets of paper to be printed or scanned one by one and feeding the same.

[0004] FIG. 1 is a drawing schematically showing a conventional apparatus for separately feeding sheets of paper. Referring to FIG. 1, the conventional apparatus for separately feeding sheets of paper includes a paper tray 1, a pickup roller 3, ADF roller(Automatic Document Feeding roller) 5, and a transferring roller 9.

[0005] The paper tray 1 is a member on which paper to be scanned is loaded. A paper perception sensor unit 2 is installed on the lower part at the front end of the paper. Whether or not paper is loaded on the paper tray 1 is detected by the paper perception sensor unit 2.

[0006] The pickup roller 3 picks up sheets of paper by contacting the sheet of paper loaded uppermost on the paper tray 1 and rotating, and is designed to selectively contact a paper by rotation of the ADF roller 5. The ADF roller 5 is for separating individual sheets of paper picked up by the pickup roller 3 and delivering the same. It has, in its lower part, an ADF rubber 6 elastically supported upward by a spring 7, for exerting frictional force on a sheet of delivered paper. The rotational operating force of the ADF roller 5 rotates the pickup roller 3 by way of a relay gear 4, realizing the above-mentioned pickup operation of the pickup roller 3. Namely, as shown in FIG. 1, if the ADF roller 5 rotates clockwise, the pickup roller 3 picks up a paper while rotated clockwise by the relay gear 4.

[0007] The transferring roller 9 is for delivering a paper delivered separately one by one by the ADF roller 5, to the side of a canning unit 12, and a transferring pinch roller 10 is installed on the surface touched with a paper so that the delivering force of the paper is strengthened. Typically, a guiding part 8 for guiding the delivered paper is installed between the ADF roller 5 and the transferring roller 9.

[0008] In the meantime, a scanning sensor unit 11 is installed between the transferring roller 9 and the scanning unit 12, and the scanning sensor unit 11 operates the scanning unit 12 after a predetermined period of time elapses if turned "on" by the foremost end of the delivered paper.

[0009] If the paper scanned by the scanning unit 12 is discharged to the outside by a discharging roller 14 and a discharging pinch roller 15 and there does not exist a paper to be scanned any more, then the scanning operation is completed.

[0010] Reference numeral 13 represents a white bar, and reference number 16 represents a transparent window for scanning a sheet of paper to be scanned by the scanning unit.

[0011] The conventional apparatus for separately feeding a paper having the foregoing construction should be equipped with the pickup roller 3, the ADF roller 5 and the transferring roller 9, in order to pick up and feed a sheet of paper. Also, as the conventional apparatus should be equipped with the gear unit for rotating these rollers, a number of elements is increased and installation space gets bigger. Furthermore, as operating force is delivered by the gear unit, noise is increased, and physical property of ADF roller 5 is varied due to its abrasion, thus the reliability of picking up individual sheets is deteriorated.

SUMMARY OF THE INVENTION

[0012] Accordingly, the present invention has been made to solve the above-mentioned problems occurring in the conventional art, and an aspect of the present invention is to provide an apparatus for feeding printing papers sheet by sheet in a scanner or a printer, which provides compactness and enhanced reliability in feeding individual sheets of paper.

[0013] The foregoing and other aspects and advantages are realized by providing an apparatus for feeding printing papers sheet by sheet, which includes: a paper tray; a rubber pad installed in the proximity to the front end of a paper stack on the paper tray; a separating/transferring roller having a nozzle part on its outer periphery, for separately feeding a sheet of paper using an absorption force, wherein the separating/transferring roller is so spaced that its upper surface does not have an effect on the back of the lowermost paper sheet on the paper tray and the separating/transferring roller has such diameter that its lower surface faces the upper window of the scanning unit.

[0014] Preferably, the apparatus for separately feeding a paper of the present invention additionally has a paper guiding part formed in a shape that corresponds to the outer periphery

of the separating/transferring roller, for guiding a paper sheet delivered by the separating/transferring roller.

[0015] Also, the apparatus of the present invention additionally has: a paper perception sensor unit for sensing whether a paper sheet is present on the paper tray; a vacuum pump for generating and providing absorption force to the nozzle part; a scanning sensor unit installed in the paper guiding part, for sensing a delivered paper sheet; and a controlling unit for controlling operating of the vacuum pump.

[0016] Preferably, the separating/transferring roller is either a grid roller having unevenness on its outer periphery or a sand roller whose outer periphery is wound with a sand paper, so that increased frictional force is exerted on the delivered paper sheet.

[0017] Also, preferably, the separating/transferring roller is either a grid roller having unevenness on its outer periphery except the vicinity of the nozzle part or a sand roller whose outer periphery except the vicinity of the nozzle part is wound with sand paper, so that increased frictional force is exerted on the delivered paper sheet.

[0018] In addition, a plurality of nozzle parts is formed on a straight line along the axial direction of the separating/transferring roller or a plurality of nozzle parts is formed alternately in a cylindrical direction on two parallel straight lines along the axial direction of the separating/transferring roller.

[0019] Furthermore, the controlling unit operates the vacuum pump if a scanning command of a user is input after the paper perception sensor unit is turned "on", and stops operation of the vacuum pump if the scanning sensor unit is turned "on" by the front end of the delivered paper stuck on the outer periphery of the separating/transferring roller, and operates again the vacuum pump if the rear end of the paper sheet passes by the scanning sensor unit.

[0020] Also, the controlling unit preferably stops the operation of the vacuum pump if both the paper perception sensor unit and the scanning sensor unit are all turned "off".

[0021] As described above, according to the present invention, many elements such as the pickup roller, the ADF roller, the relay gear for gear-connecting these rollers, which have been used for the conventional apparatus, are not required any more, and reliability of a paper separation and pickup is increased with use of only one single separating/transferring roller. Furthermore, manufacturing costs could be reduced and noise due to gear connection could be reduced as well.

[0022] In addition, installation space could be reduced, thus a scanner having the more compact design could be manufactured.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0023] The above objects and other advantages of the present invention will be more apparent from the following detailed description when taken in conjunction with the accompanying drawing figures, in which:

[0024] FIG. 1 is a drawing schematically showing a conventional apparatus for separately feeding a paper;

[0025] FIG. 2A is a drawing schematically showing an apparatus for separately feeding a paper according to an embodiment of the present invention;

[0026] FIG. 2B is a block diagram schematically showing a system for realizing the apparatus for separately feeding a paper as shown in FIG. 2A;

[0027] FIG. 3A and FIG. 3B are drawings schematically showing various embodiments of a separating/transferring roller of the apparatus for separately feeding a paper as shown in FIG. 2A; and

[0028] FIG. 4A through FIG. 4C are drawings explaining the operation of the apparatus for separately feeding a paper shown in FIG. 2A.

[0029] It will be understood that in the drawing figures, like reference numerals refer to like features and structures.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] A preferred embodiment of the present invention will now be described with reference to the accompanying drawing figures.

[0031] The matters defined in the description such as a detailed construction and elements are not intended to be limiting, but rather are provided merely to assist in a comprehensive understanding of the invention. Thus, it is apparent that the present invention can be carried out without those defined matters. Also, well-known functions or constructions are not described in detail since they may obscure the invention in unnecessary detail.

[0032] FIG. 2A is a drawing schematically showing an apparatus for separately feeding a sheet of paper according to an embodiment of the present invention. FIG. 2B is a block diagram schematically showing a system for realizing the apparatus for separately feeding a sheet of paper as shown in FIG. 2A. Referring to FIG. 2A and FIG. 2B, an exemplary apparatus for separately feeding a sheet of paper includes a paper tray 101, a separating/transferring roller 110, a vacuum pump 119, a vacuum pump operating unit 121, a controlling unit 120, a paper guiding part 105, and a rubber pad 103.

[0033] A paper to be scanned or printed is loaded on the paper tray 101, and the paper perception sensor unit 102 is installed on the paper tray 101 so that whether or not paper is loaded is perceived. Such paper perception sensor unit 102 comprises the general actuator (not shown) and the general photosensor (not shown). As the actuator is selectively rotated by the delivered paper, the photosensor is turned on/off, whereby the controlling unit 120 detects whether a sheet of paper is present or not.

[0034] The separating/transferring roller 110 is preferably spaced that its upper surface does not have an effect on the back of the paper loaded lowermost on the paper tray. Also, the separating/transferring roller 110 has a diameter such that its lower surface is touched with a scanning window 16 positioned on the upper part of the scanning unit 12. Therefore, a paper loaded on the paper tray 101 is not influenced by the separating/transferring roller 110. With such construction, a sheet of paper can be separately picked up by a single separating/transferring roller 110 without many elements such as the pickup roller 3 (refer to FIG. 1), the ADF roller 5 (refer to FIG. 1), and the relay gear 4 (refer to FIG. 1) for gear-connecting these rollers which have been required for the conventional apparatus for separately feeding a sheet of paper.

[0035] Also, the separating/transferring roller 110 is formed in a cavity tube shape 115, and has a frictional part on its outer peripheral surface 117 so that increased frictional force is exerted on the delivered paper. According to an embodiment of the present invention, unevenness is formed or a sand paper or any other suitable material is wound on the outer peripheral surface as is done in the grid roller or the sand roller.

[0036] On the outer peripheral surface 117, a nozzle part 11 connected to the cavity tube 115 via a connecting tube 113 is formed. If the controlling unit 120 operates the vacuum pump operating unit 121 and the roller operating unit 125 and the vacuum pump 119 is operated, then the separating/transferring roller 110 is rotated with the paper stuck on the outer peripheral surface 117 by the nozzle part 111. By such operation, the paper is wound on the outer peripheral surface 117 of the separating/transferring roller 110. The outer peripheral surface 117 of the separating/transferring roller 110 is preferably spaced from the back of the lowermost paper lest the paper loaded on the paper tray 101 should be separately picked up by other outer peripheral surface portion of the separating/transferring roller on which the nozzle part 111 is not formed.

[0037] Also, according to an embodiment of the present invention, as shown in FIG. 3A and FIG. 3B, the unevenness is not formed or the sand paper is not wound on a predetermined region on which the nozzle part 111 is formed. Hence, the nozzle part 111 may be more closely stuck on the paper. By avoiding unevenness around the nozzle part 111, deterioration of the absorption force of the vacuum pump 119 may be avoided.

[0038] According to another embodiment of the present invention, a plurality of nozzle parts 111 is formed on a straight line along the axial direction of the separating/transferring roller 110 as shown in FIG. 3A. Also, a plurality of nozzle parts 111 may be formed alternately in a cylindrical direction on two straight lines along the axial direction as shown in FIG. 3B.

[0039] The rubber pad 103 is installed in proximity to the front end of the paper to increase the reliability of the paper being picked up individually by the separating/transferring roller 110. Preferably, the rubber pad 103 is made of rubber in order to generate front end paper resistance.

[0040] The paper guiding part 105 is preferably formed in a shape that corresponds to the shape of the outer peripheral surface 117 of the separating/transferring roller 110, and has the above-mentioned diameter. It is preferably installed to correspond to the outer peripheral surface 117 of the separating/transferring roller 110. Thus, the delivered paper is guided to the side of the scanning unit 12.

[0041] A scanning sensor unit 109 is installed on the side of the scanning unit 12 of the paper guiding part 105. If the scanning sensor unit 109 is turned "on" by the foremost end of the delivered paper, the controlling unit 120 operates the scanning unit 12 by operating a scanning unit operating unit 123 after a predetermined period of time elapses. A pinch roller 107 is installed corresponding to the separating/transferring roller 110 so that a delivering force of a sheet of paper toward the scanning unit 12 is strengthened. In one embodiment of the

present invention, the pinch roller 107 is installed in front of the scanning sensor unit 109 on a paper delivering path.

[0042] FIG. 4A and FIG. 4B are drawings illustrating the operation of the apparatus for separately feeding a paper as shown in FIG. 2A. Referring to FIG. 4A and FIG. 4B, if a plurality of papers is loaded on the paper tray 101, an actuator of the paper perception sensor unit 102 is rotated and the photosensor is turned "on." By such operation, the controlling unit 120 detects that a paper is loaded.

[0043] When paper is detected, if a scanning command is input by a user, namely, at the status that the paper perception sensor unit 102 is turned "on," a scanning command is input, the controlling unit 120 operates the vacuum pump 119 by operating the vacuum pump operating unit 121. Absorption force by the vacuum pump 119 is delivered to the nozzle part 111 through the connecting tube 113. As shown in FIG. 4A, the back of the lowermost paper among the loaded papers is stuck on the nozzle part 111 by the absorption force from the nozzle part 111. In that state, the controlling unit 120 rotates the separating/transferring roller 110 by operating the roller operating unit 125. As shown in FIG. 4B, the paper that is stuck on the nozzle part is wound on the separating/transferring roller 110, and delivered by rotation of such separating/transferring roller 110. A sheet of paper is separated by the rubber pad 103 installed on the front end of the paper.

[0044] If the front end of the paper that is wound on the separating/transferring roller 110 and delivered, passes by the scanning sensor unit 109 as shown in FIG. 4C, the scanning sensor unit 109 is turned "on." Then, the controlling unit 120 judges that the front end of the paper has reached the scanning sensor unit 109, and operates the scanning unit 12 by operating the scanning unit operating unit 123 after a predetermined period of time elapses. By such operation, characters or images on the paper are scanned. Simultaneously, if the scanning sensor unit 109 is turned "on," the controlling unit 120 stops operation of the vacuum pump

119. Delivery of the paper after stoppage of the vacuum pump 119 is performed by the rotating separating/transferring roller 110 and the pinch roller 107 that faces the separating/transferring roller 110. Therefore, the paper loaded on the paper tray 101 is not influenced any more by the separating/transferring roller 110, but the paper stuck on the vacuum pump 110 and input to the paper guiding part 105 is delivered by the separating/transferring roller 110.

[0045] If the rear end of the paper scanned during delivery passes by the scanning sensor unit 109 completely in this manner, the scanning sensor unit 109 is turned "off" and, after a predetermined period of time elapses, the scanning unit 12 enters a standby status. In the meantime, if the paper perception sensor unit 102 still remains in the "on" status even after the scanning sensor unit 109 is turned "off," namely, if paper is loaded on the paper tray, the controlling unit 120 delivers the paper through the foregoing procedure by operating again the vacuum pump 119. A delivery interval of the paper continuously delivered by such mechanism, is approximately an arc length of the paper guiding part 105. If the paper perception sensor unit 102 is "off" status after the scanning sensor unit 109 is turned "off," the controlling unit 120 does not operate the vacuum pump 119 and stops the separating/transferring roller.

[0046] While the invention has been shown and described with reference to certain preferred embodiments thereof, it should be apparent that the present invention can be carried out without those defined matters and it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. Therefore, all such proper modifications, changes and equivalents of the embodiments of the present invention will fall within the scope of the invention.